

Application No.: 10/713800
Docket No.: CH2893USNA

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REMARKS

Status of Claims

Claims 1, 3-4, 7-17 are pending. Claims 2, 5-6, 18-29 have been previously canceled. Claim 1, 3-4 and 7-17 recite "a nozzle used in a printer for ejecting ink," to particularly define the invention. The nozzle of this invention addresses the problem of nozzle function which is hindered by materials being adhered thereto (see page 1, lines 17-20) by coating with a durable fluid-repellent layer.

Remarks

Examiner rejected claims 1, 3-4 and 7-17 under 35 U.S.C. 103 (a) as being unpatentable over Diaz et al. (EP 0 195 292, hereinafter, "Diaz") in view of Iwato et al. (WO 01/90267, hereinafter, "Iwato").

Examiner asserted Diaz disclosed a conduit having its surface or a portion of its surface coated with a fluid repellent layer wherein said layer comprises or is produced from a fluorocarbon silane, wherein said conduit is a nozzle.

Examiner conceded Diaz failed to disclose an aqueous emulsion as defined in Applicant's claims and relies on Iwato for this disclosure. Examiner asserts Iwato discloses a coating for providing improved heat resistance and water repellency properties.

Examiner asserts it is obvious to use the emulsion of Iwato in the coating of Diaz to provide improved heat resistance and water repellency.

Combination of Diaz and Iwato

According to *KSR International Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007), "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art ... common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions".

Applicant asserts to combine Diaz and Iwato all of the elements of each must be used. It is impermissible to select a reference and pick only certain elements from that reference when combining with a second reference for an obviousness rejection.

Examiner asserts Diaz discloses a nozzle comprising a fluorocarbon silane. Examiner asserts Iwato discloses Applicant's coating. Applicants respectfully assert Diaz discloses more than a nozzle comprising a fluorocarbon silane. Further Examiner ignores suggested fluorocarbon silanes of Diaz and others and then selects only those disclosed by Iwato for use in Applicant's claimed nozzle which is a different application from the glass windows disclosed in Iwato. Glass windows do not present the problems addressed by Applicant's claimed invention.

According to Diaz, there are problems with coating nozzle plates used in ink jet printing (column 1, lines 28-29). Diaz states that ink solutions wet the surfaces causing failure of the ink jet and poor printing performance (column 1, lines 29-31). Diaz provides an improvement for coating an ink jet nozzle.

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Specifically, Diaz discloses coating an ink jet nozzle plate with a film comprises TWO ingredients: a partially fluorinated alkyl silane and a perfluorinated alkane. There is no perfluorinated alkane in Applicant's emulsion, which is used to produce a fluid repellent layer on the surface of a nozzle. Thus, Examiner appears to merely select a part of Diaz teachings (nozzle plus fluorocarbon silane) while ignoring other parts (perfluorinated alkane).

Still further, Diaz discloses depositing the silane compound and the alkane on the nozzle surface by direct exposure of the surface to radio frequency (RF) glow discharge (column 1, lines 39-42; column 2, lines 9-21). No other methods are disclosed by Diaz for depositing coatings on the nozzle surface. As perfluoroalkanes are gases under ambient conditions (e.g., perfluoropropane used in the Preferred Embodiment has a boiling point of -37°C), in the absence of RF, no layer would be formed on the nozzle at 65°C.

Thus, to follow Diaz, a nozzle is coated with a fluorocarbon silane and a perfluoroalkane using RF glow discharge. For fluorocarbon silanes, Diaz discloses trifluoropropylmethyldimethoxysilane, perfluoropropoxypropylmethyldichlorosilane and dexamethylsiloxane (column 2, lines 10-13 and lines 25-27). For perfluoroalkanes, Diaz discloses perfluoropropane, a polymer from hexafluoroethylene, a polymer from tetrafluoromethane, and perfluorocyclobutane (column 2, lines 13-16 and lines 22-25).

Applicant's claimed nozzle uses none of the fluorocarbon silanes disclosed by Diaz. Applicant's claimed nozzle fails to use a perfluoroalkane. Applicant's claimed nozzle does not use RF glow discharge to coat nozzle surface.

Examiner ignores the combination of fluorocarbon silane and perfluoroalkane as taught by Diaz, and selects only a broad definition of the fluorocarbon silane element to coat a nozzle. Still further, Examiner appears to suggest it is obvious to then further ignore the suggested fluorocarbon silanes of Diaz (column 2, lines 10-13 and lines 25-27) and the fact that Diaz requires use of a perfluoroalkane and RF glow discharge and select the emulsion disclosed by Iwato from countless examples of fluorocarbon silanes available.

It appears that Examiner has relied on recited elements recited in Applicants' claims to pick and choose not only what references to select, but also which elements to select from his selected references and further to redefine the selected element outside of the selected reference, while ignoring references that have closer compositions to Applicants' claims as the basis for his rejection. Thus, Examiner's rejection of Applicant's claims being obvious over Diaz in view of Iwato is improper.

Obviousness

Examiner states "the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious." Applicant respectfully asserts that he is not merely seeking to claim an advantage as the basis for patentability. Applicant's claims are directed to a nozzle for ejecting ink coated with a layer a particular emulsion composition. Applicant respectfully asserts the following:

- (1) Diaz fails to disclose nozzle having coating of fluorocarbon silane defined according to Applicant's claim;
- (2) Diaz discloses nozzle having coating comprising fluorocarbon silane AND perfluorocarbon AND Applicant fails to use perfluorocarbon;

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- (3) Diaz discloses depositing the perfluoroalkane as a separate layer over the silane layer;
(4) Diaz discloses coating nozzle using radio frequency glow discharge whereas Applicant coats nozzle without use of radio frequency glow discharge;
(5) Iwato fails to disclose use of emulsion to coat nozzle.

Still further, Applicant has directed Examiner to other references that disclose numerous fluorocarbon compositions, which do provide repellency and/or durability (abrasion resistance and/or resistance to alkaline inks). Albinson (EP 0 367 438 B1), Griffin (WO 96/06895) and Nakagawa (EP 1 386 951 A1) for state of the art of using fluorocarbon silanes for coating of inkjet nozzles. Each of these references teaches (1) fluorocarbon silanes are difficult to bond to the materials used in nozzles and (2) when many fluorocarbon silanes are used as coatings, such coatings lack durability to alkaline materials and abrasive conditions.

Applicants respectfully assert Examiner's conclusion of obviousness is based on improper hindsight reasoning. Rejection for obviousness may take into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from Applicant's disclosure. *In re McLaughlin* 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971). Examiner has failed to consider prior art disclosing use of fluorocarbon silanes having compositions closer to the emulsion defined in Applicant's claims which show poor performance in terms of repellency and durability when exposed to alkaline conditions as experienced by ink jet nozzles (Nakagawa Comparative Example 2). Examiner merely concludes because the emulsion disclosed by Iwato has been used in coating applications, a person having skilled in the art would try this emulsion for any other coating application. Examiner ignores the fact that prior art teaches many fluorocarbon silane compositions are ineffective (see, Albinson, Griffin, Nakagawa, Diaz) and that fluorocarbon emulsions having similar compositions to that disclosed by Iwato are not effective for providing durability/abrasion resistance in the presence of alkaline inks (Nakagawa).

Applicants respectfully assert Examiner's conclusion of obviousness fails to consider prior art in its entirety. According to MPEP § 2141.02, "prior art must be considered in its entirety, including disclosures that teach away from the claims." Applicant respectfully directs Examiner to Nakagawa (EP 1 386 951), which not only teaches similar compositions to those defined in Applicant's claims are inferior to his claimed composition for use in coating ink jet, but also that similar compositions to those defined in Applicant's claims are ineffective. Thus, one skilled in the art would not look to the fluorocarbon silane emulsions of Iwato to use for coating ink jet nozzles.

Even as the nature of teaching away is highly relevant according to MPEP § 2145, Applicant asserts it is also highly relevant to consider the nature of what is being used as basis for obviousness rejection. According to MPEP § 2145, "[t]he totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of nonobviousness. *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986) Applicants respectfully assert selection of the fluorocarbon emulsion disclosed by Iwato goes against accepted wisdom in the art. Similar fluorocarbon silane emulsions failed to provide abrasion resistance in the presence of alkaline substances (Nakagawa). Different fluorocarbon silanes from Iwato did provide wear resistance for use in ink jet nozzles (Diaz).

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Examiner assertion that it would be obvious to use fluorocarbon silane emulsion from Iwato to coat nozzle of Diaz wherein Diaz discloses coating nozzle with different fluorocarbon silane from Iwato is contrary to accepted wisdom and common sense in view of Nakagawa which teaches fluorocarbon silane emulsion similar to Iwato in composition fails to provide repellency and abrasion resistance. The disadvantage of using fluorocarbon emulsion disclosed by Nakagawa would "naturally discourage" one from using emulsion of Iwato to coat nozzle. *United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966).

Applicant respectfully directs Examiner to Nakagawa Comparative Example 2 (Nakagawa, pages 13-14). The composition of this Comparative Example is more similar to that of Applicant's claimed emulsion (see Table below) than the composition of Diaz.

Table

Ingredient	Nakagawa - Comparative Example 2	Applicant's emulsion
Fluorocarbon silane	$\text{CF}_3(\text{CF}_2)_7\text{CH}_2\text{CH}_2\text{-Si-(OCH}_3)_2$	$\text{R}_f(\text{CH}_3)_p\text{-Si}\{-(\text{OCH}_2\text{CH}_2)_n\text{-OR}^1\}_3$ silicate or an organoalkoxysilane
Silicon compound	$\text{Si}(\text{OC}_2\text{H}_5)_4$	Surfactant
Surfactant	No surfactant used	Acid or base
Catalyst	HCl	Water
Water	Water	

Applicant respectfully asserts Nakagawa Comparative Example 2 is "very similar in chemical structure" to the emulsion of Applicant's claims. More so than Diaz as cited by Examiner, Applicant respectfully asserts one skilled in the art would expect that the emulsion disclosed by Iwato would perform similarly as the composition of Nakagawa Comparative Example 2. Applicant respectfully directs Examiner to compare Applicant's Example 4 with Nakagawa Comparative Example 2. In Applicant's Example 4, a nozzle treated with Applicant's emulsion is exposed to N-methylpyrrolidinone (pH 7.7) for 120 hours (15 days at 8 hours per day). Applicant's treated nozzle showed excellent repellency and durability. In contrast, substrate coated a film in accordance with Nakagawa Comparative Example 2 was treated at pH 8 for 100 hours during which the film dissolved. Thus, Applicant asserts unexpected results for nozzle treated with the emulsion according to Applicant's claims.

Applicant respectfully asserts Nakagawa is closer art than Diaz and is inappropriate for Examiner to ignore. Applicant respectfully asserts the combination of Nakagawa and Iwato teach against Applicant's claimed invention. Thus, Applicant has "proceeded contrary to accepted wisdom in the art" which is evidence of nonobviousness".

Applicant's Example 3 illustrates nozzles coated with the claimed emulsion undergoes 100,000 repeated abrasions with significant improvement in durability. Again, while Iwato fails to disclose use of the emulsion in abrasive applications, Applicant respectfully asserts these results are surprising given the state of the art (e.g., Albinson, Griffin, Nakagawa), which suggests that many fluorocarbon silane compositions fail to meet durability for use in nozzle applications.

Thus, Applicant respectfully asserts the claimed invention is not merely "another advantage which flows naturally from the suggestion of the prior art" as Examiner asserts and the claimed invention is not obvious to one of ordinary skill in the art at the time Applicant's invention was made over Diaz (or Nakagawa) in view of Iwato.

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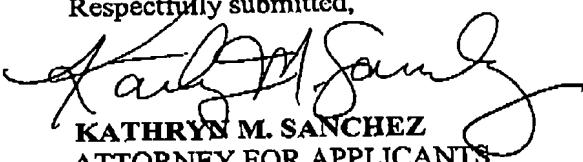
With regards to claims 3-4 as well as claims 7-17, as these claims rely on claim 1, they are also not obvious over Diaz in view of Iwato.

Conclusion

Applicants respectfully assert neither Diaz nor Iwato, nor the combination thereof discloses use of the claimed nozzle having its surface coated with a substantially aqueous emulsion; said emulsion comprises or is produced from (1) a fluorocarbon silane or its hydrolyzate, (2) water, and (3) a surfactant, a silicon compound, and a catalyst which is an acid or base, or combinations of two or more thereof; said fluorocarbon silane has the formula $R_f(CH_2)_p-Si\{-O-CH_2CH_2\}_n-OR^1\}_3$; said silicon compound is a silicate or an organoalkoxysilane; R_f is a C₃₋₁₈ perfluoroalkyl group or combinations of two or more thereof; each R^1 is independently one or more C₁₋₃ alkyl groups; p is 2 to 4; and n is 2 to 10 in a printer for ejecting ink wherein surprising improvements found in durability to exposure to alkaline conditions and abrasion resistance.

In view of the foregoing, allowance of the above-referenced application is respectfully requested.

Respectfully submitted,


KATHRYN M. SANCHEZ
ATTORNEY FOR APPLICANTS
Registration No.: 43,081
Telephone: (302) 992-2025
Facsimile: (302) 892-7925

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